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ABSTRACT

This report comprises two papers: "Can a Machine Develop a Career? A Statement About the Processes of Exploration and Commitment in Career Development," and "The Information System for Vocational Decisions: Description, Subsequent Development, and Implications." The first paper specifies an imitation career as a means of career development and defines processes of exploration and commitment in career development. The paper concludes that machines can only help an individual understand his career development; they cannot actually develop an individual's career. The second paper describes a computer-based Information System for Vocational Decisions, including planned expansion of both use and capabilities of the system. Educational, personal, and theoretical changes required to sustain the system are included and the potential future usefulness of the system in the expanding demands of vocational guidance is defined. A related document is VT 015 073 in this issue. (BH)

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CAN A MACHINE DEVELOP A CAREER?

A STATEMENT ABOUT THE PROCESSES OF EXPLORATION

AND COMMITMENT IN CAREER DEVELOPMENT

by

David V. Tiedeman

THE INFORMATION SYSTEM FOR VOCATIONAL DECISIONS:

DESCRIPTION, SUBSEQUENT DEVELOPMENT, AND IMPLICATIONS

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CAN A MACHINE DEVELOP A CAREER?

A STATEMENT ABOUT THE PROCESSES OF EXPLORATION AND COMMITMENT IN CAREER DEVELOPMENT*

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Career in Vocational Development

In Salute. I am pleased to participate in this Symposium of Perspectives on Vocational Development. Judson Shaplin is a colleague of yore. I owe much to Shaplin who stood by and helped this neophyte teacher as he strove to embrace in his career the professorship at Harvard. I in turn have been delighted to see him expand and strengthen the Institute of Education at Washington University. Furthermore, our own John Whiteley is a Harvard student seemingly of but yesterday. I continue to expect much from John who already in a few short years at Washington University has so ably demonstrated his capacity to think and do big things in the theory and practice of guidance.

My pleasure at being here extends beyond the merely personal feelings of honor I joyfully bestow upon two former colleagues in their own institution.

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I am indebted to my friend and colleague, Allan B. Ellis, whose question, "Can a machine counsel?" had such penetrating effect as to put me onto the question which became the theme of this paper.

In publishing this paper, Charles E. Merrill, Inc. understands that I personally reserve the right to use or republish it in whole or in part at will. I have in turn promised that such subsequent use or re-publication will be limited to what I conceive to be primarily scientific, not personal monetary, benefit.

I am also present in this Symposium with three professional colleagues whose work I always attempt to know intimately and whose contributions to the theory of vocational development have been considerable. It has been their work which has in part interactively caused my work to take the directions it now has. This fact appears in my work in two ways. Since I learn much from Holland, Roe, and Super whenever I read their writings, or talk with them, I always attempt to incorporate their understandings about vocational development into mine whenever mine change as they so frequently do. Also, their work is ordinarily of such excellence that I try not to duplicate it. My life is too short and my need for understanding of career development too great, for me to waste time going over ground I find each of them laying out so ably by themselves.

Phases in My Development of a Language of Career. I presently believe that my work in career development and that of my students and associated colleagues at Harvard is best conceived in five phases. The first phase which started in 1947 found me at work on occupational choice. The second phase which started in 1953 because of Super's paper on theory in vocational development (1953) found me wrestling to unite occupational choice and self concept. Beginning around 1957, I found it necessary to expand my concern with occupational choice and to encompass that of choosing anything which is founded in a belief system. The resulting union of choosing and vocational development brought me into the third phase of my thought and found me both realizing that career and vocation are not identical and believing that career is more fundamental than vocation. By 1962, I proved able in my understanding of choosing to work simultaneously with it and the process both of incorporating and of being initiating with what is originally another's

conception. This capability brought me into the fourth phase of my thought. It also gave rise to my concern for the processes of exploration and commitment in career development. Finally, by about 1963, I found myself at work with realization that the processes of exploration and commitment in career development are specific manifestations of general processes in cognitive development. This realization permitted me in turn to become more explicit about the development and application of those general cognitive processes in the realm of career.

Gordon Dudley and I (Tiedeman and Dudley, 1967), in association with Frank Field, Wallace Fletcher, and Chris Kehas, have assembled our recent joint work in a multilithed volume entitled THOUGHT, CHOICE, AND ACTION: PROCESSES OF EXPLORATION AND COMMITMENT IN CAREER DEVELOPMENT. The volume is organized according to the phases in development of my thought which I have just sketched above. The new volume represents my effort to bring my thought up to date from its condition in 1963 when, with Robert O'Hara, I published (Tiedeman and O'Hara, 1963) it as CAREER DEVELOPMENT: CHOICE AND ADJUSTMENT. Dorsey Press has recently agreed to publish a revised version of the new volume. Hence I shall rely upon it to further inform those of you who are curious about not just why I hold my present ideas but also about how my colleagues and I argue extensively for their existence. I want to do something new in this Symposium.

Thesis. This first of our two-day Symposium requires each speaker to lay out his current theory of vocational development. I shall do so in terms of a language of career, not of a theory of vocational development. I do so because I want to treat the concept of career imaginatively in this paper. I personally feel that the distinctions between vocation and career I shall make are both valid and powerful. I hope that their pursuit may bring the whole enterprise of studying vocational development to a new level

of organization with career,not vocation, as central conception. However, I need your understanding both of my career concept and of its importance if such a hope is to be fulfilled.

On the second day of this Symposium, we speakers are to say where we think the study of vocational or career development may be in 20 years, by 1988 in fact. This is a task which challenges the intuitions of each of us speakers. I am sure that each will be humble in the face of all those contingencies which ordinarily delay the emergence of the now possible and of the later emerging. However, you will find that I address my own responsibility in the general effort by both describing a computer-based Information System for Vocational Decisions (ISVD) which I am presently engaged in assembling and considering the implications for us of spreading, studying, and developing the concept of that System beyond where it now is or can be taken within the presently promised financial resources. I personally feel that the interactive possibilities inherent in the developing ISVD are at the heart of considerable and important developments in guidance and individual career development.

Because my second paper will deal with my plans for further expanding both the use and capability of a computer-based career support system, I elect in this paper to straight-forwardly address the question, "Can a machine develop a career?"

I understand that you may first incline to dismiss this question lightly. However, like A. W. Turing (1964), and my colleague Allan Ellis, I consider this question to be an extremely penetrating one. It is intended to cut through the confused and ordinarily emotionally laden feelings usually attending discussion of machines and men, particularly in guidance-like issues such as career development. Furthermore, it is intended to

examine the conditions of machine and career sufficiently closely to achieve a gain in understanding of the two by examining them together.

It is meaningless to negate the question, "Can a machine develop a career?" out of hand. In order to determine whether the question has meaning and power, it is first necessary to analyze what is meant by a career and a machine. Let us do so in that order.

An Imitation Career as Instrument in Career Development

A Time Chronology. A machine is programmed to record the dates on which an individual enters and leaves each event in his work history. If this record was feathered out so that it also gave the hours of particular days on which the person worked as well as their dates, the chronology would more accurately portray the position which the individual gave work in the time use pattern of his life. However, such a record would become more complicated than we have so far made it in vocational psychology. Therefore, let's conceive the chronology in its presently limited sense.

The dates which a person worked at each of the several jobs he held in his life when related to the person's advancing age portray aspects of work in which we have only recently become interested, namely the length of time a person stays on a particular job. Presumably, the length of time a person stays on a particular job increases as he grows older. However, technological change is said to be having considerable effect on this fact at the present time. Technological change is also said to be having effect on the number of jobs which a person will in the future record in his chronology.

A Work Vita. If we programmed the machine to record the name of the jobs an individual held in each of the periods which he worked as well as

the company in which the job was discharged, other matters of interest to vocational psychologists spring into being. We think of jobs in terms of their kinds, their responsibilities, and of the companies in which they are practiced. When we think of jobs in terms of their kinds we frequently call those kinds, "occupations." We thus consider occupation to be a more general term than a job. By making reference to the job and enterprise codes of the Dictionary of Occupational Titles (1966) stored in its memory, our machine can indicate the occupations at which an individual has worked. Our machine memory will also contain the occupational level codes of Holland (1966) and/or Roe (1956). The machine can therefore write a work vita which incorporates inferences about the level of responsibilities an individual has held and now holds. The memory of the machine will also include Super's (1957) code of enterprise. The program can therefore incorporate in the work vita inferential data about the kinds of work organizations in which the work has been and is performed.

The memory of the machine will also include Roe's (1956) group categorization of occupations. A program will be written based on these group classifications which infer the vocation which a person is pursuing. This program will be based on the consistency of the groups in which the person's occupation falls as he changes work. The program for inferring occupation will also compare the levels of an individual's several jobs as well as their groups. A vocation associated with progress in advancement level will be called a career. Persistent advances in level accompanied by changes in groups and/or enterprises will be referred to a new table which will contain career names different from vocation names based on Roe groups. Records of uniform level with variability in Roe groups will be referred to still another career table to find names appropriate for

such records. Records with vacillating levels and groups will be referred to still another type of career table to name the career. Finally, career names associated with employment in the same group at vacillating levels will be obtained from still another type of career table. The machine will also contain a table permitting the inference of interests from the work organizations in which an individual has been employed. This table will particularly differentiate self from company types of employment and in the latter case differentiate work style based on inference about work groups. Inferences about vocation, career, and work style will be further referred to tables from which personality characteristics will be inferred.

Personality Organization* in the Work Chronology and Vita. An individual's naming of his job and the company in which it is practiced can also be referred to the stored Dictionary of Occupational Titles for reference to description of its duties and prerogatives, the interpersonal, material, and ideational relationships it requires and permits, and the experiencing style it requires and permits in relation to the experiencing style effected in the non-work environment. Suppose that we consider as structure the three elements in each kind of description, namely 1) requirements and prerogatives, 2) interpersonal, material, and ideational relationships required and permitted, and 3) the experiencing style required and permitted. Furthermore, let us consider the function of aspiration in growth or effective curiosity as we might better conceive growth. Then we can consider as organization in his personality the change from one structure to another which a person attempts and effects as he vocationally responds

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*I am primarily indebted to Gordon Dudley and Eileen Morley for teaching me about the terms and concepts of organization as used herein.

to aspiration in growth. Although I cannot specify the detail at the moment, let us suppose that we can write programs which infer organization when structures are compared, pair by pair in sequence.

When the vocational history has been programmed sufficiently for organization to exist, it becomes possible to conceive development. What develops in vocation is the organization of occupational structures in service of the aspiration function. What develops in our program of vocational development is the linguistic context within which we explain the vocational aspects of the life history.

Education and the Work Chronology and Vita. Suppose that the machine is further programmed to record an educational chronology and vita as well as the work chronology and vita. When the work history is joined with an educational chronology and accompanying naming of the educational experiences associated with each of several discrete periods, we must recognize that education is no longer necessarily all concentrated before work. Therefore, two relationships of interest in vocational psychology must be programmed. One relationship which must be programmed is the interspersing of education and work. The other relationship which must be programmed is the interdependence of education and work. At the present time this interdependence can be either preparatory as it has traditionally been or synergetic as it may well more frequently become. In the synergetic condition we might well conceive a job as causing a person to know that he must expand his knowledge from education and to act upon both what knowledge he has and that prior fact while continuing in his job.

Some of the aspects of the named educational experience which must be programmed because of their interest in vocational psychology are those

associated with 1) the kind of school a person is in during a period, elementary, secondary, tertiary, for instance, and 2) the subjects he studied. The kinds of schools a person attends are programmed to relate with the conception of level in occupation. Cooley and Lohnes (1968) career tree will be helpful in the preparation of this program. However, in broader outline, the subjects a person pursues are programmed to bear both on level in one sense but on kind of occupation in a more important sense. It is the relationship of subject and occupation in the preparatory relationship of education which gives rise to entry into an occupation. It is the relationship of subject and occupation in the synergetic relationship of education which gives rise to satisfaction, success, and possibly progress in career.

Personality Organization in the Education and Work Chronologies and Vitae. Suppose that we can do for education what we have suggested can be done for occupation, namely to expand by way of some dictionary or school catalogue an individual's naming of the schools and subjects in his educational history. We could then program into our machine the provision of the requirements and prerogatives, the interpersonal, material, and ideational relationships required and permitted, and the experiencing style required and permitted for each school and subject. If we then again consider organization in personality to be the change in one structure to another which a person attempts and effects as he responds vocationally to aspiration in growth, we can again imagine a machine program written so that various characteristics of his educational organization may be inferred from comparison of these structures in sequenced pairs. The details of this machine program will be mentioned more specifically in tomorrow's talk. They remain as necessary tasks to be undertaken, not as completed studies.

We don't know much about how epistemological understanding grows.

The existence of educational as well as occupational organization introduces another problem in career which our machine program must handle. I have previously noted the essentially preparatory and synergetic relationships which education may have with occupation in the career. I note here that this relationship may in addition vacillate from time to time in the career. Therefore, our programs which write the interrelationship of education and occupation from chronologies and vitae in the dual realms must pay particular attention to the relationship which one organization is from time to time given opportunity to have on its counterpart organization.

Gribbons' (1959) conception of vocational readiness planning will provide one of the frameworks for programming the intersection of educational and occupational realms in the career. Crites' (1965) and Super's conceptions of vocational maturity (Super and Overstreet, 1960), will also provide a still higher order conception for programming of that intersection. Finally, Super's metadimensions of self concept (cf., Super, Starishevsky, Matlin, and Jordaan,1963) as expanded by O'Mahoney's (1968) theory of vocational self concept will provide the programming guides for the intersection of vocation and career.

Personality Organization in Expanded Chronologies and Vitae. I have so far described my imitation career first in terms of a chronology, next in terms of a vita, and finally in terms of a personality organization for each of two realms of activity, educational and vocational. As I did so, I noted that the issues in machine program involved the existence of a dictionary from which structure can be inferred in each realm. Organization can then in turn be inferred by conceiving the problem of expanded linguistic

meaning which arises from sequentially juxtaposing the structures of pairs in a single realm presuming that structure is changing in service of the function of growth. Finally, I noted that the existence of two organizations added to the problem of inference that of causing the organization in one realm to be programmed in interaction with the organization in the other. In the interaction I proposed that a critical factor should be the programming of the dominating or coordinating effect of one structure on another as organization changed in the function of growth. In this regard, Super's theory of vocational development (1957) might serve as a first order approximation of the needed programming. However, in all likelihood we will need many more studies on the order of that of O'Hara (1958) which dealt developmentally with the dominating and coordinating effects of awareness in several realms of vocational self concept over each of several years.

The programming which I have so far described can therefore first be considered as a general description. Chronologies, vitae, and organizations in additional realms can then also be programmed to the extent that dictionaries of structure and developmental theories of organization are available. The addition of each new realm must of course be programmed so that its effects will be written independently of other effects in pair-wise interactions with all other effects, in triad-wise interactions with all other effects, and so on up to the final single interaction equal to the total number of realms included in the momentary definition of career in personality.

Since working with Matthews (1960), I have been personally convinced that personal and family living is an effect of great importance to career in personality. I therefore ask you to conceive the programs in the imitation career to include the structures of marriage and family. It is not yet very possible to write machine programs for the development in

personality which includes marriage and family structures. However, Jeannette Friend and Matthews have case material from which fair approximations will be possible, at least for women's careers. Furthermore, Super's Career Pattern Study (Super, Crites, Hummel, Moser, Overstreet, and Warnath, 1957) can be counted on for information of this nature.

Dynamic Personality Organization in Expanded Chronologies and Vitae. I have so far deliberately spoken of structures which are defined just in terms of our knowledge. I shall call this knowledge public knowledge (Landy, 1968).

The machine which I shall envisage is to be one in which the individual may enter his programs so that they may also control inferences from chronologies, vitae, and organizations just as our programs control those inferences. In fact, you will see that I will also speak of a machine which permits the individual to substitute his program for parts of ours as he grows in his understanding both of how to do so and of why doing so is advantageous to him.

In terms of the machine which I have just described, I then trust that it is not too great a jump in imagination to consider a career machine which contains the dictionaries and inferential programs of the individual just as they contain our dictionaries and inferential programs. Let us refer to such knowledge as private (Landy, 1968), or experiential knowledge. Such a machine can then be programmed to give to educational, job, and personal and family living events the individual's content as well as ours. For instance, an individual's naming of his job and the company in which it is practiced can very well be expanded by his description of its duties and prerogatives, the interpersonal, material, and ideational relationships it requires and permits, and the experiencing style it requires and permits in

relation to the experiencing style effected in non-work environment. These descriptions can be daily ones or of longer periods of time. Normally they are the latter. The descriptions can also include what is hoped and planned for as well as what is taking place. Finally, the description can provide for continuous revision of past impression based on new experience and thought.

By the same token, an individual's naming of a school and a subject in his educational history can be expanded by his descriptions of its requirements and prerogatives, the interpersonal, material, and ideational relationships each has required and permitted and the experiencing style it requires and permits. Again descriptions can be recorded in minute or large periods of time. Normally they are recorded for larger not smaller periods of time. These descriptions can also include what is hoped and planned for as well as what is taking place. Furthermore, each new recording can include revision of former recordings as new experience and impressions expand the meaning of prior events for the individuals.

Finally, as has been noted when we spoke about the public organization of personality which could be conceived in one realm, then in two, and finally in any number of realms, similar conceptions of the programs for our machine are possible in the realm of private knowledge. One realm of considerable import is that of personal and family living. Events in marriage and family formation and growth can for each such event be expanded by the individual's descriptions of its requirements and prerogatives, the interpersonal, material, and ideational relationships each has required and permitted and the experiencing style it requires and permits. Again, descriptions can be recorded in minute or large periods of time but for the moment we will imagine programs in which the period is larger, not smaller.

Finally, these private descriptions can include what is hoped and planned for as well as what is taking place because our machine permits the direct entry of such personal information without needed recourse to dictionaries and inferences even though such could be personal in the case of private information. Furthermore, each new recording can include a revision of former recordings as new experience and impressions expand the meaning of prior events for the individual.

Suppose, as we did with public knowledge, we define structure in terms of the three elements: 1) requirements and prerogatives; 2) interpersonal, material, and ideational relationships required and permitted; and 3) the experiencing style required and permitted. Furthermore, suppose that in the case of private knowledge, we consider the procedures of 1) review, and 2) planning. Then the machine programs of career in the realm of private knowledge must deal with <u>both</u> structures and procedures as they produce personality organization for the function of aspiration in growth. However, the necessary machine programs cannot be expressed in the linguistic structures of <u>our</u> public analysis of personality organization. When we let the individual program his own descriptions of events giving rise to private structures, we allowed the association of our public linguistic framework of organization with the private procedures of review and planning. We can, of course, simulate some of this planning as Boocock (1967) has done in the case of the Life Career Game.

The machine will be programmed to use the data of the Bureau of Labor Statistics to incorporate localized and continually updated projections about opportunity in <u>occupations</u> and <u>education</u>. This program will be available in connection either with the simulation of the game or with the individual's interactive career describing when he is engaged in the procedure of planning.

When the individual is engaged in the interactive procedure of planning, he will also have available another machine program which allows him to find out what educational and/or occupational opportunities are available for his placement in the near future.

As indicated, the machine program for dynamic personality organization will make explicit the union of the private knowledge of review and planning procedures and knowledge of psychological processes which can themselves only be private. I shall soon say more of these important processes. I want first to enunciate a seeming difficulty I have bought in my imitation of career at the expense of introducing another's terms into our analysis.

When the individual has placed his own organization of educational, occupational, and generational events into the machine, his organization of each may be compared with our organization of them. This comparison is the central dynamic of personality development. We program the machine so that the comparison is made. However, we must also program the machine with care at this point because we do not want unexamined acceptance of our terms. Instead, we want a condition in which the individual comes to realize a harmony in the structures of form and of his experience.* The structures of form are both the public and private structures in his personality organization. The structures of experience are both those unsimulated by the imitation career which is being constructed for him with the machine and those simulated by the machine including simulation

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*This concept is due to John Wideman in my awareness. However, Myra Gannaway and Esther Wiedman have given the concept centrality in my concept of the imitation career.

of planning and practice in valuing** and in relating self concept and occupation.***

The judging of harmony in the structures of form and experience occurs in the processes of exploration and commitment**** in career development. Hence, public developmental programs, vocational or career, must also be first programmed so as publicly to monitor these processes in the interaction of machine and individual. Remember that this interaction has now been programmed in our imitation career because the individual descriptions of events in chronologies, vitae, and organizations are programmed for comparison with our public descriptions of them. In the review procedure, the comparison program should foster bisociation (Koestler, 1967) between and among pairs of structures, public and private, in the several realms written into the machine program of the imitation career. The bisociation experience is a part of the exploratory process which the machine program will foster. In the planning procedure, new

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**Martin Katz taught me the importance of the conception of valuing. He is in turn developing a machine (1968) to relate the concept to educational and vocational development. Hutchinson (1967) has a procedure which makes exploration of the consequences of values possible in the predictive realm of abilities and educational or occupational rewards.

***Terence J. O'Mahoney, a doctoral student at the University of Leeds, is developing this procedure based on the principle of comparing and indicating preferences for vaguely defined occupational pictures judged in pairs (See O'Mahoney, 1968).

****O'Hara and I first dealt with exploration and commitment at an implicit level in 1963. In Career Development: Choice and Adjustment (Tiedeman and O'Hara, 1963), we implicitly used these conceptions in our analysis of the procedures associated with decision-making in career development. Field (1964) and Kehas (1964) subsequently helped me to put them implicitly into the context first of purpose and then of self concept. However, it was Dudley (1966) who brought them explicitly to my attention in relation to the choice process. It was Segal who helped me bring them into explicit use in the definition of predicaments, problems, and psychology (1967).

alternatives and their associated structures are to arise from machine programs arranged so that alternatives and structures can be under private consideration both in a condition of exploration and in a condition of tentative commitment. The difference is that in the exploration process fixation of alternative is likely to be only fleeting, while in the tentative commitment process, fixation on alternative is likely to be more enduring and also likely to lead to expansion in private structuring of one or more alternatives because of the condition of bisociation. The process of commitment is associated with the stabilization of fixation on alternatives for a sufficiently long period of time to permit implementation to occur in relation to plan for personality re-organization in career.

Obviously, the programs monitoring the processes delineated cannot now be written with any precision. You will find that their writing remains a task I set for myself and our field in the near future. However, this should not prevent us at the moment of conceiving their existence and in turn of conceiving their revision and use on a personal basis on the part of the individual himself. The existence of our monitor creates the structure within which the development of agency in the personality has possibility of forming. Agency exists in the development of initiative while effecting harmony in the structures of form and experience. In the development of agency there therefore exists chance for the incorporation of the structure of our monitor of that harmonization into the personality itself. The substitution of a personal monitor for our monitor constitutes a recurrence phenomenon which is the ultimate form of the imitation career, namely the developed capacity for harmonization of the public and private forms of harmonies of form and experience. It is in this instrumental sense in the imitation career that I speak of bringing into awareness the

harmony of form and experience within the linguistics of career.

The harmonization of the public and private forms of harmonies of form and experience represents a phenomenon whose form has been given by Landy (1968). Landy proposes that knowledge is public and private, tacit and explicit. Tacit and explicit understanding have been further explicated by Polanyi (1956). Public and private knowledge has been defined in the imitation career. If these two dimensions are conceived as spanning a two-dimensional Cartesian space as Landy conceives them, then awareness of the phenomenon of agency constitutes the personal movement of knowledge from the private and tacit quadrant across into the public and explicit quadrant. Tarule (1968) indicates how this philosophy can be realized in the context of interest, aptitude, and achievement testing. Her structure must therefore be a part of the machine programs creating the imitation career in the linguistic contexts of education, occupation, and generation.

Finally, machine programs in our imitation career which produce the effect of awareness in the individual cause choosing to have explicit form. In the context of choosing, educational, vocational, and generational choices themselves can have explicit existence in the mind of the individual. The patterning of the actual linguistic structure of harmony in form and experience of the individual is his identity. Erikson's schema (1959) of ego identity therefore becomes the final framework within which agency development must be programmed in the imitation career. This is another of the requirements for the imitation career in need of a great deal more work before the imitating of career will become much of a reality.

A Machine*

In examining the question, "Can a machine develop a career?" we frequently erroneously conceive a machine as having the properties of a person who is himself developing the career. I have no intention of conceiving my question this way. Instead, consider a very simple machine, a so-called Turing machine.

According to Turing (1964), a digital computer consists of only three parts:

1) a store;

2) an executive unit; and

3) a control.

The store part of the computer is usually associated with the common conception of "memory." For instance, it is in the store of a computer that we could save the facts/data of our occupational descriptions and the programs which we have previously written to associate occupations with jobs. The store can thus contain both the facts/data which are to be processed and in Turing's terms "the table of instructions" for their processing. I have in the section on the imitation career called Turing's "table of instructions" a computer program.

The executive unit is the part which actually carries out the various individual operations involved in following a program contained in the store. For instance, the actual operations required to transform a new fact into a processed datum would be carried out in the executive unit under control of a program which I have specified.

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*I am particularly indebted to Allan Ellis for putting me on to the form of discussion of a machine which is presented in this section.

According to Turing, "It is the duty of the control to see that these instructions (Author's note: or programs in the store) are obeyed correctly and in the right order. The control is so constructed that this necessarily happens." (Turing, 1964, p. 8)

I trust it is apparent that I have not used the term "compute" in defining the Turing machine. Although a computer is a Turing machine, not all Turing machines need be computers. A Turing machine merely performs explicit operations in definite sequences.

Tomorrow I shall describe a Career Machine, the Information System for Vocational Decisions, which will operate as a Turing machine in an actual computer. However, today I want us to understand that computers don't merely compute. They do of course have the capacity to evaluate with great rapidity mathematical functions of great complexity. However, they are also merely Turing machines which undertake explicitly denoted functions in explicitly known ways. In this way what they do has the appearance of being logical. However, the logic is that we have been able to program the machines to do not anything that the machines originally had programmed into them.

Finally, I trust that one other fact about computing machines has also become apparent from this short description of a Turing machine. The store of a machine can contain "books of instructions" in Turing's terms, or programs in my language of the imitation career. Therefore the executive unit of the machine can be programmed so as to call on stored subsidiary programs at will. Furthermore, these stored subsidiary programs can in turn operate on facts which are momentarily coming into the machine in the definite form which the subsidiary program requires for their recognition and processing. A stored subsidiary program can therefore

put the machine into a particular state which we may want it to have at any instant in which the data appropriate to that state are expected. Thus the modern computer is not a machine; instead it is a set of machines which can be made either at a programmer's will or at direction of his previously stored programs.

Can a Machine Develop a Career?

Return to thesis. This paper addresses the question, "Can a machine develop a career?" I indicated in the beginning that I considered this question to be powerful, not facetious. I also indicated that I would first need to specify both an imitation career and a machine before I could address the question itself. Since I have now indicated both what an imitation career is and what a machine is, I here turn to the major question, "Can a machine develop a career?" I do so in terms of three subsidiary questions, namely:

1) Can a machine develop a career for an individual?

2) Can a machine develop a career with an individual?

3) Can a machine develop a career for itself?

I owe the third question to Allan Ellis who is collaborating with me in preparing a paper on what is to us the ultimate question in guidance, namely, "Can a machine counsel?" My treatment of the career question for the machine will not be like our joint treatment of the counseling question for the machine. I leave full treatment of that question for the future. However, I do here attempt partial consideration of it as a fourth in my series of questions.

Several Meanings of "Imitation" in Literature in the Human Uses of Machines. Ellis has called my attention to several meanings which authors have given to the conception of "imitation" as they address the possibility

that machines can perform psychological functions such as developing careers. One of the senses in which imitation has been used is that of simulation. In simulation, the machine is programmed to engage as much as possible in human-like functions. Therefore, in using a machine for simulation purposes, one is essentially trying to duplicate human processes. Although my consideration of the question, "Can a machine develop a career <u>for</u> an individual?" may at first give the appearance of being based in the argument of imitation as simulation, this is not actually the case. My reasoning with the question will be based on a third and so far little used sense of "imitation," namely that of an instrumentality the examination of which enlightens human reasoning.

A second sense of "imitation" in the literature on machine usage is that of artificial intelligence. In this sense, the machine is programmed to do things which <u>seem</u> to be intelligent. The ultimate in exhibition of intelligence is of course, the development of programs which give the appearance of learning from past events. This is the goal which creators of artificial intelligence strive to reach. Although my consideration of the question "Can a machine develop a career <u>with</u> an individual?" may at first appear based in belief in artificial intelligence, this will again not be the actual case. As I indicated above, I shall examine the question from the third or instrumentality sense of "imitation." As I have so far twice indicated, there is still a third sense in which one can conceive "imitation" in relation to the potential power of humans with machines. In this third sense which I owe to Ellis, the imitated is an instrument. In this usage, the instrument is actually known as an imitation and the person is not therefore deluded into confusing his own processes with those

of the machine. An instrument of this sort can be a powerful aid to understanding. A person may reason with it. A person can learn from reasoning with it and without danger of confusing what he can do with what the instrument can do. Richards (1955) has pointed out the value of such instruments in the study of the humanities. For me, career is a human product which must be treated in human ways. Hence, as I examine the general question, "Can a machine develop a career?" I shall always be doing so while conceiving the Imitation Career which I specify in the second general section of this paper as an instrument with which a person may reason, not as a substitute for either his actual career or his intelligence in that actual career.

Can a Machine Develop a Career for an Individual? You will recall that I specified my imitation career in terms of machine programs which will printout:

1) a time chronology of a work history;
2) a work vita;
3) the personality organization in the work chronology and vita;
4) the union of education and the work chronology and vita;
5) the personality organization in the education and work chronologies and vitae; and
6) the personality organization in expanded chronologies and vitae.

As I proceeded to specify the imitation career in its instrumentality sense, I noted places in which our existing knowledge of vocational development makes it difficult to provide programs for the enlargement of a vocation into a career. However, I also noted that the Dictionary of Occupational Titles and supporting work by the Bureaus of Employment

Security and Labor Statistics make it possible even now to infer occupation from job titles. I also indicated that the work of Holland and Roe made it possible to infer vocation and at least advancement as an aspect of career. Furthermore, their work and that of Bordin, Nachman, and Segal (1963) and Cooley also makes it possible to unite some of the childhood and educational history with the vocational history. Finally, I indicated that Super's work on vocational development makes it somewhat possible to program development in personality organization.

This accumulation of what we know about programming in imitating a career in the simulation sense is not impressive. It is for this reason that I will tomorrow propose a set of studies designed to bring us to an enlarged condition of being able to approximate better the actual career through programming of an imitation career. However, my main point today is that there is nothing inherently impossible, from the standpoint of a machine, in developing careers <u>for</u> individuals, at least in the sense of being able to imitate a career in the instrumentality sense of "imitation." It is quite true that in our present state of knowledge, the imitation will fall far short of the actual career. However, the non-correspondence of reality and imitation is our fault, not the machine's fault.

<u>Can a Machine Develop a Career with an Individual</u>? The final sub-section of the imitation career specified the programs which would be required to imitate the <u>dynamic</u> personality organization in expanded chronologies and vitae. That sub-section was developed on the assumption that a career is not just something which is written; it is something which is had. In having a career an individual comes into interaction with the part of the machine instrumentality that can write a career <u>for</u>

the individual. The imitation career in its simulation sense in turn programmed this interaction so that balance in the structures of form and of experience was continually weighed by a monitoring function. However, the imitation career in its instrumentality sense let the person substitute his monitoring function for ours as the person proved capable of writing his own machine which would possess the balancing effect in structures of form and of experience.

As I again proceeded to do what I could to specify the machine programs which will in simulation do the things I claimed for them, I indicated that Gribbons' vocational readiness planning, both Crites' and Super's conception of vocational maturity, Katz' conception of the valuing process, and Erikson's conception of identity offered the best approximations now available to the form a machine would be given in order to develop a career with an individual. However, I again want to stress that the present large gap in the correspondence of actual and imitated careers which persons are having is no reason to dissuade us that a machine can develop a career with an individual. The problem is not to abandon attempts to create a simulation machine which will develop careers with individuals. The problem is to make our simulation machines which do so prove able to do a more effective job of it. As I shall next indicate, such good simulation machines will still not destroy their instrumentality effect.

Can a Machine Develop a Career for Itself? As I started this paper, I thought that I had pushed my argument to its limit when I had examined the preceding two questions about what a machine can do in developing careers. However, Ellis, in his usual educative way, destroyed satisfaction

with my understanding by in turn asking, "Can a machine develop a career for itself?" He also, as the teacher he is, next aided my balancing of new form and of experience by teaching me about the distinctions in meaning of "imitation" as I have outlined those meanings above.

The Ellis question confused me at first but I came to grips with it by attempting to analyze it. In the first place, I found that one of the meanings of the questions is, "Can a machine develop a career by itself?" I have in the sub-section entitled, "Can a Machine Develop a Career for an Individual?" therefore already examined a part of Ellis unsettling question. Yes, a machine can develop a career by itself. The career, of course, is not that of the machine; the career is that of the individual which the machine imitates in an instrumentality sense.

A second phase of Ellis' question is, "Can a machine develop a dynamic personality organization in expanded chronologies and vitae?" This is of course, the question which I examined when I spoke of a machine developing a career with an individual. However, in doing so, I admitted that the person was in actual interaction with the machine. Furthermore, I admitted that what was originally my monitoring by simulation of the individual's balance of structures in form and experience was gradually to be replaced by the individual's valuing of that balance. It would appear then that I was admitting that the machine could not develop a dynamic personality organization in expanded chronologies and vitae. But wait, tomorrow you will find me advicating research in the interactive functions when an individual is actually engaged in personally determining his career. As such research progresses, I will become able to program the machine so that it in turn writes monitoring programs more closely approximating those written by individuals in the past. I am hopeful enough about the

patterning in that activity to expect that I can get to predict personal monitoring functions reasonably well. When I can do so, I can then in turn program a machine which will develop a career by itself, even in the second or dynamic sense of career. This will be an imitation career in the artificial intelligence sense of "imitation" as well because it will then become a self-correcting program.

Before despairing for humans, however, I trust it is apparent that I argued by recursion as I examined the second of my questions about whether a machine can by itself develop a dynamic career or not. The trouble with the recursion argument is that it collapses in its limit. There will always be some stage of the recursion in which more experience must be accumulated in the present in order to make the machine be more effective in the future when the programming is done on the basis of prediction. Thus although the form of argument I have adopted has gotten me far down the road of believing for myself that a machine can write a career for itself in the sense of artificial intelligence, I have not fully addressed the question, "Can a machine develop a career for itself?"

In its most general form, the question, "Can a machine develop a career for itself?" essentially asks, "Can programs be written for the machine which will have the effect of giving the machine a career?" Although this question may prove threatening, I contend that its examination can prove enlightening. If we can determine to what extent we can generalize the programs in which the machine develops dynamic careers by itself in the artificial intelligence sense of imitation, we can determine to a greater and greater extent what a machine does when it develops a career for itself. Doing so would advance the language and ultimately the

theory of career development a considerable way in my judgment. However, it would not of course either substitute machine careers for human careers nor deny the sense in which the imitation career is an instrument, not a master. Please remember that I have argued by recursion, not by direct logic. The esoteric career will still exist. I merely hope that my imitation career will in turn make it better understood.

Can a Machine Counsel? Although I do not intend to examine this question fully in this paper because I intend to do so with Ellis in a subsequent paper, there are a few observations which Ellis has already brought me to understand which are important for my argument in this paper. When in the just preceding sub-section I admitted that the recursion argument I had adopted to examine the question of whether a machine could develop a career for itself or not was a weak and potentially deceiving argument, I then went on to address the question on different grounds from those of having machine programs written according to an imitation career. By the same token, I can examine the question, "Can a machine counsel?"

If Ellis and I examine the question, "Can a machine counsel?" from the identical standpoint of this paper, we will find ourselves limited by the same logical constraints which gave rise to recursion as ultimate recourse in the question "Can a machine develop a career for itself?" We would first specify imitation counseling, a machine, and then ask questions about whether imitation counseling in simulation and artificial intelligence senses approximated real counseling or not. For this reason, it is well to examine the question "Can a machine counsel" from the instrumentality, not the simulation or artificial intelligence sense of imitation. If we do so, we will address a different set of questions.

Ellis and I are convinced that such a set of questions can help us tease from counseling those things which have to be done by humans because they are human things, from those things which can be done by machines in counseling because they are instrumentality things.

The Value of the Question. I trust that the value of the question, "Can a machine develop a career?" now has some balance of its form with your experience. If so, you will probably attribute value to the question. If not, I have not yet proved convincing. To those not yet convinced, I can merely list here the value which the question has had for me.

In examining the question, "Can a machine develop a career?", I first had to specify the imitation career as an instrumentality in career development. That accomplishment represents the culmination of some twenty years of thought. In specifying the instrumentality of career development, I therefore moved the language of career development which I started to write with O'Hara in 1963 into explicit form so that it may now be investigated by anyone. I have also indicated how I fit the vocational development work of Bordin, Nachman, and Segal and of Holland, of Roe, and of Super into that instrumental framework. I have also indicated that, with more research which I will specify further tomorrow, we can provide machines which will do a pretty fair job of developing careers for individuals in the simulation sense of "imitation." Furthermore, I have indicated that with use of that research we can in turn start doing a reasonably good job of providing a machine which will develop careers with individuals in the instrumentality sense of "imitation." While doing that I also succeeded in explicitly defining processes of exploration and commitment in career development. Finally, I have indicated that several years or so

of doing the latter can in turn give us a machine which will do a fairly effective job of developing careers for itself in the artificial intelligence sense of "imitation." However, in conclusion, I had to admit that I should turn the whole argument into a new set of questions in order to address more squarely the problem of generating a machine which will both develop careers for itself and counsel. Such an address really gains the admission which relaxes us all, even those really helped in their career development by machine. Machines don't actually develop an individual's career. Machines can only <u>help</u> individuals <u>understand</u> their career development. To this end machines are instruments, not masters, in career development.

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INFORMATION SYSTEM FOR VOCATIONAL DECISIONS

Project Report No. 16b

THE INFORMATION SYSTEM FOR VOCATIONAL DECISIONS: DESCRIPTION, SUBSEQUENT DEVELOPMENT, AND IMPLICATIONS

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THE INFORMATION SYSTEM FOR VOCATIONAL DECISIONS: DESCRIPTION, SUBSEQUENT DEVELOPMENT, AND IMPLICATIONS*

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SECTION A: CONTEXT

Plan with Thesis

Plan. Yesterday I analyzed the question, "Can a machine develop a career?" In doing so, I specifically presented my language of career development in the form of an instrumental imitation career. I also specified in the imitation career, the processes of exploration and commitment in career development. I then explored the major question in terms of three subsidiary questions, namely, "Can a machine develop a career 1) for an individual, 2) with an individual, and 3) for itself?" I concluded that a machine can develop a career in all three ways but that the answer became subject to the weakness of a recursive argument in its third phase. I therefore stated that the machine can develop a career in only an instrumental sense, not in a simulation or artificial intelligence sense.

Thesis. My analysis of careers and machines was undertaken as context for this paper as well as 1) for specification of my language

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In publishing this paper, Charles E. Merrill, Inc. understands that I personally reserve the right to use or republish it in whole or in part at will. I have in turn promised that such subsequent use or republication will be limited to what I conceive to be primarily scientific, not personal monetary, benefit.

of career development, and 2) for illustration of the power of treating my subject as if it were a machine. Today I shall first describe the specific machine which several colleagues* and I are assembling at Harvard University for trial in the Newton School System and its environs with the assistance and equipment of the New England Education Data Systems.

I yesterday noted several deficiencies in our knowledge. I shall today more specifically focus on those deficiencies after I describe what will then be our available machine, namely the Information System for Vocational Decisions, or ISVD for short. This description will lead to a proposal for seven to ten years of research which Allan Ellis, Robert O'Hara, and I hope to undertake with the assistance of the ISVD machine.

I indicated yesterday that the research Allan Ellis, Robert O'Hara, and I hope to undertake on the ISVD machine constitutes a direction several of us at Harvard plan to give to development of the theory of careers. If we are successful in gaining support for our research proposal, we will then become a force in the theory of careers which will make the field of guidance and counseling grow in directions we would like to see it take. I shall today specify some of those directions in the form of the economic, educational, and theoretical implications for a well developed ISVD machine. My account may well not delineate very well the potential condition of research in careers for 1988. However, I think it will provide fair guides for what research and practice may be like in at least the early 1980's.

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* Principal Investigators of ISVD are Russell Davis, Richard Durstine, Allan Ellis, Wallace Fletcher, Edward Landy, Robert O'Hara (Executive Director), David Tiedeman (Chairman), and Michael Wilson. Research Associates of ISVD include: Duncan Circle (1967-68); David Clemens (1966-67); Lawrence Lerer (1966-69); and Eugene Wilson (1966-69).

SECTION B: A CAREER MACHINE

The Information System for Vocational Decisions

Primary Data Files of the ISVD. The Information System for Vocational Decisions is to be a system in which facts/data* about educational, military, and vocational opportunities are turned by each of its inquirers into the information of a personally-determined career. The ISVD will contain three primary data files, one for each of these kinds of opportunities. These data files will be much like the files of abstracts created by the Educational Research Information Centers (ERIC) system which several universities are creating with initiative and support from the U.S. Office of Education. I shall return to this point at a later juncture.

Each of these three primary data files in the ISVD will be partitioned in several ways. One of these partitions will serve to distinguish between the stages of exploration or clarification in decision-making. The facts/data available for an educational, military, and occupational alternative will be fewer and at a more general level for the exploratory mode than for the clarificatory mode. When exploring, an inquirer will not be expected to maintain preference for an alternative. He will be expected to be forming his personal bases for preference among a set of alternatives. When clarifying, he then will be expected either to maintain his preference for an alternative or to return to exploration. In this phase of decision-making, the inquirer is expected to bring the perspective of doubt to a

* Facts/data come in two conditions, fixed and modifiable. I therefore elect to adopt the cumbersome term, "facts/data", to indicate this throughout the paper. Facts are directly recoverable without mediation except for storage and later recovery. On the other hand, data must be additionally processed by the numeric and/or linguistic routines of a mediational system.

previously crystallized choice and to bear the anxiety of ignorance in the face of new facts about the chosen alternative.

A second partition of each of the primary data files will be applied within its exploratory and clarificatory parts. This partition will be according to the discontinuity, or socially induced choice situation, in life for which the data file is pertinent. With the education data file, this partition will specialize according to choice of: 1) high school curriculum; 2) post-secondary institutions; 3) post-secondary specialty; 4) graduate institutions; and 5) graduate specialty. In the case of the military data file, the partition will be directed toward promotion within the enlisted and officer ranks of each of the three major U.S. Armed Services. In the case of the occupation data file, it will include the choices: 1) occupation; 2) placement; 3) promotion; and 4) career. The occupation data file will have an adjunctive file incorporating forecasts by industry according to national and regional conditions. The primary purpose of facts/data on forecasting will be described shortly.

Purpose and Self Development through the ISVD. The ISVD will offer access to the three primary data files within the context of achieving purposeful activity during self development. Two pedagogical modes will be provided for this context. One mode will be teaching about concepts relevant to purpose in self development. The concepts included in this mode will be: 1) the psychology of becoming purposeful; 2) self and decision-making; 3) psychological attributes and educational, military, and occupational decisions; and 4) any needed instructions for use of the three primary data files.

The second pedagogical mode will be that of decision-making applied to the data both of another's life and of one's own life. The basic mode with the data of another's life will be that of a game. An inquirer will either cooperate or compete with others in playing rounds in a game context that requires time planning in relation to future possibilities and consequences. The context of time planning will be in terms of education, work, leisure, and family. Future possibilities and consequences will be retrieved in part from the forecasting data file mentioned earlier. The playing of rounds of the game will provide rudimentary simulation of career development. However, the ISVD will also let inquirers substitute their <u>own</u> data in the game structure and will then use this simulated career development structure <u>in personal decision-making</u>, that is in decision-making in which the person is himself both player and object of the game. In personal decision-making, the basic pedagogic mode will be that of guidance in counseling. In this mode the internalization of the game structure into the personality is expected and facilitated so that the game structure can become a guiding or feedforward (Richards, 1968) mechanism in the anticipatory activity of the inquirer.

<u>Secondary Data Files and Routines in the ISVD</u>. The substitution of one's self for the life circumstance of another will create need for two kinds of secondary files. One secondary file will be that of the individual's own education and psychological characteristics. This file will be created and maintained both to permit counselors to call for cumulative records, and to permit individual inquirers to generate alternate possibilities for themselves by using the predictive framework in relation to anonymous psychological characteristics, choices, and later accomplishments as based

on histories of other similar inquirers which will be stored in this file. This technique will in the ISVD be augmented by a procedure due to Thomas Hutchinson (1967). The Hutchinson procedure will allow the inquirer to specify both the alternatives he is considering and the levels of reward which he seeks from each specified alternative. The procedure will then provide indication of whether the inquirer's psychological data are like those of others who before him chose the alternative, and whether they achieved the designated rewards or not.

The secondary file will store important elements of the person's decisional frameworks in working out his life plans. The file will consist of summary statements which the person generates at the conclusion of each use of the repetitively applied routines of the ISVD in relation to each discontinuity in which he addresses his future and learns from his past. The inquirer will thus <u>himself</u> be engaged in abstracting his life circumstances while creating these data for his life.

Inherent in the secondary file on the person's decisional framework will be a procedure due to Terence J. O'Mahoney (1968). This procedure will be a paired comparison of vaguely <u>pictured</u> occupational activities presented to reveal the person's self concept in the context of occupational activity. Such paired comparison operations give an inquirer clearer linguistic understanding of himself. The understanding will then be an <u>explicit</u> basis upon which the inquirer can deepen his knowledge of his union of personality and occupation. Use of the procedure will be available for the mode of exploration, not clarification. In short, the O'Mahoney procedure as expanded from its present context of just occupational pictures will permit decision in an educational, military, occupational, or family

context to aid in discovering harmonies and disharmonies in personal psychologies and activities.

Role of Language in the ISVD:
A Digression and Explanation

As has been noted, the basic aim of the ISVD is to help an inquirer to create a language structure in harmony with his evolving vocational development. In the ISVD, the computer is to assist in the processes both of his vocational development and of its harmonization with personal career development.

The personal career development which the ISVD attempts to cultivate presumes the existence of discontinuities in the person's vocational development. A discontinuity has both external and internal referents. The external referents are those aspects of the societal structure which precipitate discontinuity of personality development by virtue of forcing choice in order not to have a prescribed set of experiences and requirements for all citizens. In the ISVD, these external referents are keyed to the educational, occupational, military, and personal and family living decisions which are available in the United States.

The internal referents of discontinuities are those aspects of ego processes which give rise to and/or support the emergence of self awareness in career development. The internal referents emphasize the continuities of personality during the meeting of a discontinuity of society. As such they tend to stress the integrative aspects of personality in career development in relation to the differentiating aspects of society in vocational development. These internal referents are thus the potentially

harmonizing conditions in the growing linguistic differentiation of vocational development which the ISVD seeks to cultivate during career development.

The ISVD assumes that there exists a discernible and explicable process during any meeting of the externals and internals associated with a societally-generated discontinuity in life. The ISVD further assumes that this process is eventually analyzable by the person experiencing the discontinuity into anticipatory and accomodating phases. The Tiedeman and O'Hara (1963) theory of decision-making on which this assumption is predicated further assumes that the phase of anticipation is both publicly and personally analyzable in terms of the steps of exploration, crystallization, choice, and clarification and that the phase of accomodation is likewise analyzable in terms of induction, reformation, and integration.

The ISVD is planned to bring attention upon the processes of vocational development for the purpose of achieving further harmony in career development. This attention will be sought both in a machine and in a personal context. In the machine context, the person interacting with the System will be treated as if he is an inquirer, a person who is himself in search of answers for problems which he is generating and who is also willing and able to assume responsibility for the actions predicated upon such inquiries. For this reason, the machine context of the ISVD will include the primary data files which have been outlined briefly in the immediately prior section.

The inquirer's searches of primary data files will also have to be mediated by the computer. This mediation in the ISVD requires the career machine to understand the inquirer's English. This stance is necessary

in the ISVD in order to keep the subject's interaction as that of inquiry. The stance is even more necessary because the role of the System is to facilitate the incorporation of the terms of the guidance machine into the English upon which an inquirer becomes ever more aware that he has predicated his vocational and career developments. Thus through teaching, practice, and interpersonal relations, the ISVD expects the incorporation of the English understanding of the System into linguistic structures of the person. MONITOR will be a central concept for this incorporation. MONITOR will be a System control for checking the inquirer's understanding of the linguistic framework of his vocational and career developments. MONITOR will also consist of the rules and processes which went into our creation of that control. Through this means, the ISVD expects that a person will permit himself to be guided from our control to his own by the internal operation of his intelligence as he grows in wisdom about his career development. 'MONITOR' is our way of expressing this control as it is taken over by the person in his machine interaction. Supervision by counselors and instructors is our way of further generalizing 'MONITOR' in order to complete its internalization and operation in everyday practice by the individual.

The teaching of the career machine to understand English and the incorporation of that process because of interaction with an inquirer gives rise to the machine operations which I have previously referred to as those of the secondary data files. I presume you can see that secondary data files must be planned to operate in two ways. One of these is subsidiary to primary data files when matters of accuracy in inquiry of those files are involved. The other is superordinate to the primary

data files when the teaching and practice of decision-making is in focal attention. It is in this superordinate operation that the hard design puzzles of relating MONITOR and 'MONITOR' to English actually rest.

This sketch of the ISVD is neither easy to construct nor to understand. However, I trust that I have now created enough both of a review of the prior section and of an overview of terms and later discussion so that I am justified in proceeding with more of the detail of how ISVD will actually be structured so that some of its aims can be realized.

From Facts/Data to Information

Information from Facts/Data. The details of the primary and secondary data files noted in the prior section are an inherent part only of the ISVD. However, the information processes which are inherent in them have more general applicability extending to all library data processed with the help of a computer. A particularly significant library project of this nature is that of the several ERIC projects. Each ERIC center has a particular subject. The researchers in each Center are responsible for assembling and abstracting published literature in their subject and for servicing requests for references in that literature. The subject of guidance and counseling is handled at the University of Michigan under direction of Professor Garry Walz. I particularly want to refer to Walz' contributions to the theory of information generation as I prcceed to consider that theory and the ISVD.

Walz and Rich (1967) have a significant article on ERIC and its potential contribution to the practice of student personnel services. In this article, they first describe the processes of abstracting, indexing,

and cross-referencing reduced information somewhat as I have described in a prior section on the ISVD. They then go on to consider both the predictable outcomes of those processes and their implications for student personnel services as well. These predictions and their implications constitute a potential possible in ERIC but not yet thoroughly implanted.

Predictable outcomes of the process of data decomposition and article retrieval are, according to Walz and Rich: 1) synthesis and evaluation become dominant processes; 2) gaps in the information structure become evident; 3) use of impersonal resources increases; 4) opportunity for interprofessional interaction increases; 5) information, not a book, is retrieved; and 6) time to information is reduced and the band width of information is increased. The implications of data decomposition and article retrieval for pupil personnel services are: 1) the approach to learning will become that of inquiry; 2, 3, 4) the information generation process will require new skills to approach learning including stress upon the processes of evaluative integration and of coagulation, not absorption of information; 5, 6) changed methods of professional communication and increased collaborative efforts will occur; and 7) small esoteric information systems will develop. Walz and Rich (1967) have thus enumerated important sets of outcomes and implications. However, their conclusion is:

> Perhaps one of the most important conclusions to be drawn from reviewing the outcomes and implications of information systems is that they may well <u>not be</u> a significant force for change. Wherever we have used "will", we just as well could have inserted "can". We are more assured that the mechanics of information systems are workable than we are that individuals can make the necessary changes in attitudes and beliefs to use them. The emergence of information systems is undeniably a force for change in counselor education. Whether it results in changes or not will depend upon the professional response to that force. (p. 284)

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Thus Walz and Rich stop somewhat short of asserting that data reduction and interactive retrieval actually will have the noted consequences. I in turn claim that the ISVD brings data reduction and interactive retrieval into a condition where the Walz and Rich consequences actually will be realized, not just can be realized. The ISVD is itself an interactive data reduction and retrieval system embedded within expectation, learning, and practice of personal decision-making. Facts/data are turned into information by the inquirer within the context of decision-making when decision-making is subject to MONITOR, a concept I now specify.

ISVD and MONITOR. As has been indicated, the basic scheme of ISVD is based upon data files in which previously known facts/data are stored. The System will then guide personal interaction with the data files. Personal interaction is both to be taught and to be used in the System. Use of the System can first be as a game and then in the reality of one's own life.

MONITOR refers to the computer control functions associated with the creation of self awareness during the decision-making practiced while using the primary data files. MONITOR will be fashioned to operate at three levels of awareness. At the rudimentary level, vocational development, vocational maturity, and agency development theories will be used within the paradigm of decision-making which I have outlined above. At this level, the System will itself be programmed just to assess the quality of decision-making as dictated by the concepts of the several theories. This will provide a first-order and mechanistic way of guarding

The second level of operation of MONITOR will be that of giving the inquirer access to the rules and procedures of the first-level MONITOR. Each time the inquirer enters the System to interact in relation to a discontinuity in his future he will be encouraged to summarize his experience in relation to prior discontinuities which he has considered in the System. This process, which is named that of REVIEW, will include a routine which will create a juxtaposition of current statements about past experiences with past statements about what were then expectations about future events. This process of comparing the formerly anticipated with the presently actual is one of the important processes in the ISVD. The comparisons will be processed in the ISVD by the secondary data files having to do with the generalization of decision-making into career development within the context of vocational development. This processing will require all of the procedures of heuristic meaning creation which are inherent in the ERIC system, namely 1) the provision of an original product (in the ISVD this is the summary of past experience which the person first supplies), 2) the abstracting of that product (in the ISVD this is the turning of the summary into form permitting comparison), and 3) the creation both of primary and coordinate index terms and of a thesaurus of synonyms of them. In the second level of operation of MONITOR the inquirers in ISVD will first be instructed in our System use of this data reduction process. The inquirer will also have to be given access to the procedures by which a primary and coordinate index and a thesaurus of synonyms operate in the ISVD computing system. He will then be permitted to use his own primary and coordinate index terms and thesaurus to process the summary data collected during REVIEW of his career development both at

the moment and in past uses. This procedure will actually create the smaller esoteric information systems which Walz and Rich suggest within the conception of ERIC. However, within the ISVD these smaller esoteric information systems will be really personal and not accessible to another except upon authorization of an inquirer. In fact, the smaller esoteric information systems are the rudiments of the cognitive structure upon which the inquirer premises his personality in the realms of educational, military, vocational, and family decisions. ISVD will thus encourage the existence and applaud the formation of smaller esoteric information systems. These personal guidance systems constitute the compromises with totality which the individual must make while being accurate, detailed, and honest with himself in an ever-maintained effort to perfect his understanding of his actions and his experience.

ISVD and Meaning through Thought, Counseling, and Supervision. Although the substitution of this second level personal 'MONITOR' information system for the original System MONITOR represents a giant step toward understanding in individuality, it does not represent the completion of the process. Completion of the process further requires the machine-free use of 'MONITOR' in the practiced use of thought in experience and action. This condition is never fully attained; it is only ever more closely approximated.

It requires generalization of two phases of 'MONITOR'. One is that of the language of 'MONITOR' itself. MONITOR will necessarily be linguistic. As Dudley and I (Tiedeman and Dudley, 1967) indicate, language can never be fully co-extensive with experience. Therefore, the inquirer must be encouraged to see 'MONITOR' as but a stage in understanding his harmonization of language and experience, not the end result itself. The

end is more akin to his realization of language and experience as a paradox (Tiedeman, 1967), a predicament capable of being understood and appreciated but incapable of full formal construal in co-extensive fashion.

The second part of 'MONITOR' which must be generalized in reaching for a practiced ease with thought, choice, and action is the inquirer's use of the condition in a social, not just a machine, context. In short, the person must generalize his personal 'MONITOR' from machine context to interpersonal context. The counselor who supervises the inquirer's discovery of his personal 'MONITOR' within the interactive computer processes of the ISVD must be the first agent of this generalization. The counselor must use his own interaction with the inquirer as laboratory for that generalization and focus his skill in the assessment and cultivation of creative processes upon the attainment of that generalization <u>itself</u>. The supervisor of a person at school, Armed Service, or work in turn has opportunity to be the second-line agent of generalization of 'MONITOR' from machine to interpersonal context. The vocational educator or supervisor who accepts this opportunity must also use his own interaction with the inquirer as laboratory for the generalization, but must focus his skill on the <u>substance</u> of the inquirer's role obligations in the <u>particular</u> situation under supervision. Finally, the inquirer is himself the ultimate agent for generalization of 'MONITOR' from machine to interpersonal context. He must experience the weakness of the machine MONITOR within the context of his fantasy about control over circumstance, and, with practice in machine and interpersonal contexts, gain confidence in his capacity to know some <u>but not all of</u> his anticipatory guiding system and its consequences in his life space.

I trust it is clear that the ISVD with its expected ramifications into non-machine and personal collaborative activity offers potential through MONITOR, 'MONITOR', counseling, and supervision of turning the reduction, retrieval, and use of facts/data into an information generating function which in turn is used, understood, and appreciated. In this sense I believe that what Walz and Rich suspect only can happen within ERIC will happen within ISVD.

Despite the strength of my assertion for the information generation potential of ISVD, let none of us suffer the delusion that information generalization will actually occur universally. The ISVD will expect information generation to happen. The ISVD will consistently attempt to make information generation occur. The ISVD will be diagnostic about failures of information generation to appear. However, the ISVD will only actually accomplish information generation with those inquirers who both catch on to its theory and themselves come to use that theory without defense toward the System's part in its origin. An educator, vocational or otherwise, can do no more, even with a computer-based guidance system. Each man lives his own life. All I can hope is that he becomes the architect of his future as he does so.

SECTION C: FURTHER DEVELOPMENT OF THE CAREER MACHINE

A Proposed Splitting of Goals and Organizations of the Information System for Vocational Decisions

The U.S. Office of Education is providing support to the President and Fellows of Harvard College from 1 June 1966 through 30 June 1969 for the construction and provision, in second-generation but still only prototypic form, of the Harvard-NEEDS-Newton Information System for Vocational Decisions which I have just described in Section B. As indicated, the ISVD is a computer-based guidance system in which decision-making is given the role of information generation. Facts/data about education, military service, occupation, and family living can be turned into the personal information of career through the interactional mediation of inquirer and System on a repetitive and long-term basis.

Allan Ellis, Robert O'Hara, and I are presently proposing that the future goals and organizations of the ISVD be split as of 1 July 1969. On the one hand, both the operable data files on education, military service, occupation, and family living can then be brought into more general practice, and further pioneering in the moderation of computer software for reason of making the computer more educational can also then be simultaneously undertaken. The New England Education Data Systems is preparing and submitting a proposal along both of these lines.

On the other hand, the fact that the second generation ISVD provides a guidance system in which choice processes can be studied operationally also needs to be emphasized and encouraged without direct encumbrance by the press for immediate operation. This is the direction which the

particular proposal I consider here will take in search of additional support from the U.S. Office of Education.

The ISVD and Choice Processes

The original U.S. Office of Education grant which is creating the present ISVD will achieve two major advances in the use of computers in education. On the one hand, computer programs will be turned for ISVD from teaching programs into career-deciding programs. The computer thereby becomes an environment not just for teaching, but for education as well. On the other hand, the career guidance software and supporting curriculum are being developed in form required to make information generation through career decisions possible. The System thereby becomes an environment not just for the retrieval of facts/data but for maturation as well.

The turning of the computer from a "teaching" machine into a "career" machine on its way to becoming an "education" machine was a feat of no mean proportion. Hardware had to be assessed, ordered, and assembled. Basic time sharing systems had to be modified. Intermediate languages which could be used, first by counselors unfamiliar with computers and later by inquirers similarly unfamiliar with computers, had to be developed and implemented in the newly modified time-sharing systems. Hardware modifications also had to be developed and provided to control the mediation of the career materials in the manner prescribed by the decision-making theory on which the project developed. The result, however, will be a System capability in which ends determination will be available to inquirers themselves, not just means prescriptions on the basis of another's goals as is now the case. Thus the ISVD moves the computer one step away from

a "teaching" machine and one step toward an "education" machine. We hope that the System will thereby help the world out of a confusion which was evident to Einstein even as early as 1941, namely:

> "Perfections of means and confusion of goals seem -- in my opinion -- to characterize our age." (Einstein, 1941)

The turning of guidance books and career research into guidance materials capable of generating information was not an easy task. A theory of data files had to be developed (Durstine, 1968). Guidance materials and career research had first to be "cannibalized" and then to be "regenerated" in forms basic to the mediational processes which the System offers in its interactional forms. As indicated in Section B, the mediation is that in which the System serves as model and library, but the individual serves as decider and controller. The particular theory which had to be developed in machine-operable form is that also mentioned in conjunction with the Access Routines, EXPLORATION, CLARIFICATION, and REVIEW, and the information generation functions, MONITOR, 'MONITOR', and supervision. The result however, will be a System which will in theory provide a laboratory for the study of choice processes in cognitive development, a laboratory not heretofore available. We note that the laboratory availability is only theoretical at the moment because the mode of resource investment in the ISVD required that the prior accomplishment of a "career" machine had to precede the provision of a choice process laboratory, and the mode of delivery of a prototype, not a complete System, permitted us to furnish only all the needed models, not a complete set of needed materials.

Piaget (c.f. Flavell, 1963) and Bruner (1962) have been instrumental during recent years in bringing cognitive development into the fore of psychological interest. Existentialists among humanistic psychologists have in turn focussed upon processes in the evolution of responsibility and identity.

Parallel but not connected with the evolution of knowledge about choice processes in cognitive development has been the provision and study of self theory largely stemming from the original work of Rogers (1951). Super (1963), O'Hara (1967), and O'Mahoney (1968) have been instrumental in incorporating vocational development into self development. The ISVD has in turn been instrumental in incorporating Gribbons' vocational readiness planning (1959) and Crites' vocational maturity (1965) conceptions into operable frameworks in which their realization may accompany expansion in awareness of choice processes and cognitive development. Finally, the ISVD itself generates and reacts to the possibility structures which Tyler and McQueen (1968) are now studying.

The developmental plan of ISVD called for the provision of primary data files for choice activity in the realms of education, military service, occupation, and family living. Data files which are subsidiary to the categories of the primary data files in relation to the accuracy of their use but superordinate to the primary data files in relation to their effect upon vocational readiness planning, vocational maturation, vocational development, and agency development then had to be constructed. The subordinate character of the secondary data files led to processing for accuracy inherent in MONITOR. The superordinate character of the secondary data files led to the processing of agency development through accuracy in decison-making. This superordinate character gives rise first to 'MONITOR', the individually constructed and used machine context of responsible activity in choice and later to supervision, the individually demonstrated responsible and accurate implementation of choice in social context with authority as the central relationship which has to be understood, and hopefully appreciated.

The placing of the choosing problem into the computer context of a "career" machine as we have done above emphasizes the fact that the main theoretical problem in agency development through the understanding of choice processes in cognitive development is that of laying out the development of understanding and appreciation of the fact that language and experience are not co-extensive however much man is inclined to make them so and however much his society supports and acclaims such efforts. Tiedeman and Dudley (1967) have laid our the rudiments of the needed theory. Since that time, the work of Polanyi on the tacit dimension (1966) has come to be much more the core of theoretical interest in the ISVD. At the present time, the particular interest in choice processes in development which is sought, expected, and facilitated by ISVD is that of tacit dimension as recently stated so succinctly by Polanyi (1968), namely:

> "The structure of tacit knowing includes a conjoint pair of constituents. Subsidiaries exist as such by bearing of the focus to which we are attending from them. In other words, the functional structure of from-to knowing includes jointly a subsidiary 'from' and a focal 'to' (or 'at'). But this pair is not linked together of its own accord. The relation of a subsidiary to a focus is formed by the act of a person who integrates one to the other. And so the from-to relation lasts only so long as a person, the knower, sustains this integration." (p.30)

This is the theory and the structure of the ISVD in a nutshell. The development we wish to study is that of its realization and application in the realms of career.

The time, financial, and research resources existing in ISVD through June 1969 will provide 1) the primary data files, 2) models of the subsidiary operations of the secondary data file, and 3) at least one model of the superordinate operations of the secondary data files. However, neither the subsidiary nor the superordinate operations of the secondary data files

will be advanced sufficiently to make possible immediate longitudinal study of choice processes in cognitive development. Therefore, Ellis, O'Hara, and I propose to do additional research which should take place in two stages. Stage I should be planned as a three-year field study in which the linguistic material necessary for completing the operation of subsidiary and superordinate functions in the secondary data files will be collected and turned into programs which operate the interactive "career" machine. Stage II should be planned as a three-year overlapping longitudinal study of the development of choice processes in cognitive development. The particular choice processes under study will of course be limited to those associated with the cultivated evolution of personal responsibility in career development. Stage II will also need a fourth year to complete analyses and reporting.

Proposal

Stage I. An important reason why more work could not be done in ISVD itself on providing the superordinate functions in the secondary data files is the present relative absence of case materials stretching over life. What was needed was talk with potential users about discontinuities associated with education, military service, work, and marriage and family. We were unable to locate or generate these protocols in the detail and volume necessary for creation of applicable dictionaries, thesauruses, and processing routines.

In Stage I of this proposed research, we therefore hope to remedy the defect of detail and volume of talk about life's discontinuities in which the ISVD encourages reflection and in turn cultivates understanding

of reflexive activity in man's humanness. We propose to interview about 100 people in each of the following discontinuities or transitions:

Education:

1. Kindergarten to primary grades
2. Primary to intermediate grades
3. Intermediate to junior high school grades
4. Junior high school to senior high school grades
5. Senior high school to post-secondary grades
6. Post-secondary to graduate school grades
7. Graduate school to advanced management grades (?)

Military Service:

1. School to military service
2. Work to military service
3. Within service promotional opportunities
4. Military service to school
5. Military service to work

Occupation and career:

1. School to work
2. College to work
3. Graduate School to work
4. Work to continuing education
5. Promotion with selected occupational and job categories

Marriage and family:

1. Marriage
2. Work to family (for women only)
3. Family

4. Household purchase
5. Family to work (for women only)
6. Work to retirement
7. Career during retirement

Care will be taken while sampling at each of these discontinuities to stratify the sample according to:

1. Sex
2. Ethnic background
3. Socio-economic status
4. Scholastic aptitude (if still needed)

The interview data will be used in the preparation of an ISVD-like computer-based interactive interivewing system which will emphasize the development of responsibility in relation to the meeting of discontinuities in life. The primary analyses will be in terms of:

1. Crisis intervention as propounded by Caplan (1961)
2. Possibility structures as propounded by Tyler and McQueen (1968)
3. Planning ahead after 40 as propounded by Hahn (1966)
4. Vocational readiness planning as propounded by Gribbons (1959)
5. Vocational maturity as propounded by Crites (1965)
6. Vocational development as propounded by Super (1957)
7. Agency development as propounded by Field (1964), Tiedeman and Dudley (1967), and O'Mahoney (1967)
8. Character development as propounded by Kohlberg (1964)
9. Self development as propounded by Hershenson (1968)

The outcomes of the analyses are to be dictionaries and thesauruses of terms which would provide interviewing capability when inserted into

1) the Access Routines of REVIEW, EXPLORATION, and CLARIFICATION as needed, and 2) the superordinate procedures required in MONITOR, 'MONITOR', and supervision. These dictionaries would consist of classifications of the words and phrases actually used by subjects in discussing various discontinuities in terms of the nine theoretical orientations outlined above. They would therefore provide the consensual link between theory and verbal data which would allow the System to conduct similar interviewing in Stage II.

It is estimated that three years will be required to complete this phase of the work. The first year will be given to the planning and conducting of the interviewing. The second year will be given to the preparation of the computer system which will be required to round out the delivered Prototype II of the ISVD into a fully operating System available for service from kindergarten through retirement. The final year will be given to field testing and additional modification of the System as well as to planning for the overlapping longitudinal study which would follow as Stage II of the work.

Review. The research which Ellis, O'Hara, and I envisage is planned for a seven-year period. The intention is to conduct a project which will require three years as Stage I to complete the needed laboratory system for basic research in choice processes described in Stage II. Stage II will be planned in terms of three years of data collection and one year of data analysis and reporting.

We propose that an organization such as the U.S. Office of Education which might subsidize this plan should consider the third year of Stage I as a year, during the Fall Term of which, a review of the project will take

place by site visitors and organizational personnel in order to determine if the overlapping longitudinal study is appropriately ready in terms of: 1) its technology, namely a probably completed ISVD; 2) adequate administrative arrangements for the three-year longitudinal study which would then be in the immediate offing; and 3) adequate design and theory on which the overlapping longitudinal study will then be conducted.

Stage II. During the fourth year of the intended seven-year grant, Ellis, O'Hara, and I now plan to conduct an overlapping longitudinal study designed like that of Cooley (1963). In this study, subjects will be started in the System at kindergarten age. The age at entry of the next group of subjects who will also be started in the same year, namely Fall 1972, will be two years greater than the age of the kindergarten group. This cascade-like pattern will be repeated throughout the desired age range. The one year overlap at the beginning and end of each group will therefore permit bites of two years each to be taken in the age span in the overlapping design. Thus in order to cover the ages from 5-6 to perhaps 75-76, 35 groups will be needed. It is planned that groups consist of from 200-250 persons. Groups are to be stratified according to:

1. Sex,
2. Ethnic background of family,
3. Socio-economic background of family (or of person if he is then living independent from his original family), and
4. Scholastic aptitude if such a control seems necessary.

The subjects should theoretically be permitted to use the System as frequently as they wish during the course of their presence in the study. We would budget on the assumption that such use might average about eight

times per year. In doing so, however, we have also determined that we will contact subjects each quarter if they have not themselves reported for interaction with the System. This will insure four observations per year and a minimum of 12 observations per subject if we are able to keep them in the System for duration of the study. We will, of course, keep track of, and attempt to see the effect of, requiring subjects to use the System as opposed to their voluntary use of the System. We will also try to assess what effects, if any, may have been created in the data because subjects move away during the study or later refuse to participate.

The primary data of the analysis will be collected in the Access Routines of REVIEW, EXPLORATION, and CLARIFICATION. It is in conjunction with these Access Routines that MONITOR, and 'MONITOR' primarily function. Thus the storage of responses and self-initiated activity in the Access Routines constitute the prime record of personality which is assembled in the laboratory which the ISVD will then be.

The chief focus of the analysis will be on the steps of exploration, crystallization, choice, and clarification of the anticipatory phase of decision-making as these steps and phases are defined in the Tiedeman and O'Hara (1963) paradigm of decision-making. The secondary focus of the analysis will be on the steps of induction, reformation, and integration of the accommodation phase of the paradigm. This secondary phase will examine the development of awareness of anticipatory behavior in the setting of personality structuring. The steps of both phases will be identified and examined in relation with each discontinuity which the person reported and/or faced while participating in the study. The harmonization of these

steps and phases in the course of career development represents the self development which will be exposed by the data of this study.

In addition, the data will be examined in terms of:

1. Caplan's theory of crisis intervention;
2. Tyler's theory of possibility structures;
3. Hahn's theory of planning;
4. Gribbons' vocational readiness planning;
5. Crites' vocational maturity;
6. Super's vocational development;
7. Tiedeman's agency development;
8. Kohlberg's character development; and
9. Hershenson's self development.

Although it is possible to promise at this time that developmental sequences in relation to each of the above nine concepts will be a part of the outcome of this study because the primary concepts of these theories will be a part of the then completed ISVD, it is not possible to portray at this time what the structure of development of choice processes themselves will actually be. It is our present inability to do just this which causes me to propose the research which Ellis, O'Hara, and I have described here. We believe that the natural history procedure which the ISVD generates will provide the best data yet available, or planned, to lay out the development of choice processes in self development.

SECTION D: ECONOMIC, PERSONAL, EDUCATIONAL, AND THEORETICAL IMPLICATIONS OF A WELL DEVELOPED CAREER MACHINE

Return to Thesis

The theory of this Symposium is to give you the opportunity to hear several of us intimately at work in the theory of career development. The theory of the Symposium is therefore itself set in the context of the tacit dimension which the ISVD is designed to bring into the realm of explicit and public knowledge for each person. In the Symposium case, however, the tacit dimension called for was that of the subsidiary current status of our work which was to be focussed on the point of our future work. In the ISVD case, the tacit dimension called for is that associated with personally developed careers.

I have attempted to write my papers in implicit conformity with that tacit dimension in order to share with you an experience of mine which illustrates what I am talking about as an experience capable of universal realization. I did so by yesterday giving you a context within which my past work received explicit statement and my future work could be explained as plans. In doing so, I have demonstrated the integration of the past and the planned future which is in me.

In the present paper, I have taken off from your understanding of the imitation career which I here took as the theory of my career machine. I then explained what my colleagues and I are developing as that career machine. I have just finished presenting what three of us who are engaged in the initial work on the career machine will attempt to get supported in order to develop the ISVD career machine to a condition in which it

will make the study of choice process much more explicit than is now the case. In conclusion, I shall revert to the more general aim of the Symposium, namely to state the implications which I can anticipate for the existence of the ISVD career machine and the study of choice processes with its improved version. I do so by discussing the economic, educational, and theoretical implications of both of these conditions.

Economic and Personal Changes Needed to Sustain Emerging Computerized Guidance Information Systems

Potential Costs, Benefits, and Operating Economics of Computerized Guidance. I predict that computerized guidance support systems will continue, expand, and improve. However, in order for my prediction to become a self-fulfilling prophecy, the economy of guidance is one of four conditions which will have to undergo radical change. The outlines of the needed economic changes are at best only vaguely discernible in the present developmental condition of computerized guidance support systems as a whole. Therefore, I elect to continue my analysis of the needed economic changes in relation to an ISVD, a type of system I know best and the system which will require the most radical change in both educational organization and practice and their finance.

The potential costs of an ISVD will depend primarily on the cost of time-shared computing connections and on what parts of an ISVD an inquirer elects to use and with what frequency he operates within an ISVD during a year. If an ISVD is used in its entirety about 25 hours a year by each inquirer it is likely that the annual direct operational cost per inquirer can be on the order of $20-30. Continual maintenance and updating of discs

and files at a computing center with which remote console stations connect will probably add up to 1/10 of the operating cost.

An ISVD-type of system can of course be sub-divided and its parts can be marketed at lower annual expenditures per inquirer than those I have just mentioned. I deliberately noted expenditures as high as $20-30 more per inquirer per year just to let you know the size of the league in which I think we are playing with computerized guidance support systems. However, the benefits to individuality which can be expected from ISVD-like guidance support systems are sufficiently magnificent for us to recognize that they cannot be attained for "peanuts."

How can we expect that an ISVD will be financed? In the past several years I have become aware of the dual role which government plays in the provision of guidance services. If we remember that government operates in three conditions, local, state, and federal, then the government in its entirety practically single-handedly provides support <u>both</u> for the education and for the employment of counselors (see Tiedeman and Field, 1965). Except for some private support of tuition in education and for some small quantity of fees paid privately for service, guidance functions governmentally. This is a fact to which we counselors should attend more carefully. It has a profound influence on how far and how fast we and United States citizens can and will advance guidance in our civilization.

The fact that guidance is almost completely a governmental function means that its goals are predominantly set on the basis of economy, not primarily on the basis of quality and/or desirability. This fact retards the change of goals for guidance and the expansion of service for the citizens of the United States.

Although I suspect that the majority of support for guidance must remain governmental, I think that the quality and quantity of our services might change more rapidly if the purchase of services were put in the control of individuals, not governmental institutions such as schools and employment services. Marvin Adelson, System Development Corporation, implanted this idea in me (see Tiedeman and Dudley, 1967a). For me, the idea finds potential implementation in the form of a career insurance system which I contend that private companies and the government should begin to develop. We have developed a Federal Old Age Assurance Program over the past several decades. However, at the present time, a citizen's career planning and its implementation is suffering as much as his retirement planning and implementation. I have therefore speculated on the possibility and desirability of a Federal Career Satisfaction Assurance Program. Such a program should include annual payments to a citizen for career review such as would be possible in an ISVD and, when needed, tuition payments for career regeneration perhaps as many as seven times during a life, without specific charge. Income for the program would be provided by premiums collected periodically during the actual work life just as social security contributions are now collected.

If private insurance companies and/or the federal government were to spawn programs such as this proposed Career Satisfaction Assurance Program, we could place money directly into the hands of citizens for their repetitive guidance and frequently continuing education. The existence of a large market of this kind could then markedly change the participation of the so-called Education Industry in the fortunes of guidance. Such a generating function in the economy of guidance would probably bring about

a giant step in private investment in computerized guidance support systems which are ISVD-like. In the offing would then be individually rented computer discs, the equivilent of the safety deposit box, but in this case for personal autobiographies which would advance to the status of personally guiding mechanisms. Guidance would spring from the personal analysis of one's history as well as from the externally framed "view" of the future.

Investment: The Bearing of the Presently Uneconomic for the Sake of Probable Future Economies and Improvements. As you know, I predict that computerized guidance support systems will continue, grow, and improve. However, my statements about the economic hurdles standing before that eventuality should convince you that my prediction is by no means a certainty. My prediction can only become somewhat more likely if you counselors begin to sense the potential inherent in such support systems. I believe that the potential is there. However, we face a period in which we must today undertake a somewhat uneconomical form of support system for the sake of nourishing what is only now infantile. On the other hand, if your use of the now developing computerized guidance support systems actually forms a sufficiently critical mass, I am convinced that private investment will be attracted by these support systems, thus insuring their continuation. Nevertheless, the issue is in present doubt. The issue can be resolved both by you counselors who must get your constituents to risk slightly higher cost today in the uncertain but likely hope of improved service and civilization tomorrow and by system purveyors who must market parts of an ISVD-like system in ways such that potential users can move gradually, but still definitely, toward use of the full system.

Educational and Personal Changes Needed to Sustain Emerging Computerized Guidance Information Systems

I have just argued that developmental computerized guidance systems can become operational systems if you present counselors take them into your hearts and tolerate some slight uneconomical procedures today, in return for some large likely gains tomorrow. However, if you decide to take on the task of cultivating the growth of this new infant now among us, there are also changes in your organization, yourselves, and your future colleagues which you will have both to countenance and to effect.

Educational Re-organizations Implied by an ISVD. The primary goal of an ISVD will be the provision of an information generating function which is specific to educational, vocational, and personal decision-making. The basic attitude required for cultivation of this information generating function is that of inquiry. The computer support library of facts/data must be seen as a needed partial illumination but not as sufficient for completion of an internally organized guiding system. Completion or integration of an internally organized guiding system requires that the person as inquirer must be brought to invest what are originally another's facts/data with his own meanings, activities, and responsibilities, thereby additionally making them understood and appreciated.

The intent of an ISVD will be realized best in a school climate in which inquiry is the pedagogy primarily used by teachers (see Tiedeman, 1966). When the entire school climate favors inquiry, the inquiry required for operation of an ISVD will be consistent and mutually reinforcing. This is not to imply that an ISVD cannot operate in a neutral climate. The

inquiry which will be required in an ISVD undoubtedly will be self-generating and self-supporting. However, the effect of an ISVD is not likely to be so pervasive and enduring if it does not occur in mutually supporting atmosphere in the entire endeavor of education. Thus counselors who believe in an ISVD enough to use it should also try to see that its inquiring atmosphere has generality in their schools.

An ISVD will primarily foster self development through practice and mastery of decison-making applied in the realms of education, vocation, and personal and family living. The theory of ISVD basically assumes both the differentiation of self in the three realms and the integration of the discontinuities thereby experienced because of widening personal awareness of one's own agency in one's development. A counselor will basically have to appreciate the ISVD theory if it is to work. Otherwise he will not expect the ISVD outcome as he must if it is to be helped to appear. I think that counselors can find the theory of an ISVD quite compatible with their present overall philosophies and theories. However, an ISVD will certainly mean that a specific interest in educational and vocational decision-making must become an expected part of the counselor's functions. Unless the counselor believes so, he and an ISVD will be incompatible.

An ISVD will elaborate the presence of the guidance program in a library-like arrangement. Thus an ISVD will require that books, films, and computer console arrangements be coordinated effectively. This requirement will again bear upon the counselor's belief in his functions and place of operation.

An ISVD will elaborate placement as a context in which choice behavior is momentarily surfaced in consciousness and becomes quite available for

modification. This requirement will also influence counseling functions in an ISVD-type system.

Finally, an ISVD can be made available to people in places other than schools. This requirement will mean that counselors have to recognize their community through their aims rather than through their work locations. An ISVD should be exploited as a resource in schools, employment centers, industries, libraries, and, eventually, in homes as technology and economies permit. In sum then, counselors are going to have to re-examine many attitudes about their organizations, their philosophy and theory, and their functions if an ISVD-type system is to have opportunity for implementation.

Counselor Changes Implied in an ISVD. I found it impossible to separate the counselor from his setting as I described the educational re-organization implied in an ISVD. Hence I have already made several comments on changes in counselor attitudes which might be required of some counselors if an ISVD is to work. In addition, I will in the immediately following section on changes in counselor preparation suggest several changes which will have profound consequence for the practice of counseling. These consequences will be felt by today's practicing counselor as well as by those yet to arrive on the scene of counseling. Therefore, I limit my remarks in this sub-section merely to two attitudes which you counselors will have to adopt if the computerized guidance support potential I favor is to arise.

One of the two attitudes which you counselors will have to adopt is that of accepting the computer's demands that data input be accurate and complete in terms of previously specified programs. Unfortunately, you will suffer this demand in a time when computer operation is itself far

from mechanically and technically perfect. Therefore, the demand may well occasionally seem intolerable.

The second of the two attitudes which you counselors will have to adopt is that of not telling an inquirer a fact of educational or vocational opportunity but of attending to his process of information generation itself. I personally believe that you will find the process of information generation challenging and fulfilling so I do not anticipate difficulty on this score.

Counselor Education Changes Implied in an ISVD. I am acutely aware as I write of potential changes in counselor attitudes and theories which a system such as ISVD requires that the chief source of difficulty in acceptance may rest as much, if not more, with us counselor educators as with you practicing counselors. We counselor educators must take heed of an ISVD in our future as well as in the counselor's future.

An ISVD has numerous implications for the preparation of counselors. I consider but a few of them here.

Inherent in an ISVD will be the concept of a personally-determined guidance system. This reference to "guidance" is far different from that of our texts on principles of guidance and from ordinary meanings of guidance. Hence, one of the requirements for change in counselor education which an espousal of an ISVD will bring is the superordination of the meaning of "guidance" to the technique of counseling (see Tiedeman and Field, 1965 for expansion of this argument). Counseling as a technique must be conceived as a means for the achievement of the goal of a personally-determined and understood guidance system, not as itself conveying that goal as is now presumed to be the case.

Inherent in an ISVD are the concepts of both a guidance testing support system and a guidance teaching support system. The computerization of the testing and test interpretation system as well as the designing of a guidance teaching system create new conditions in testing. The new conditions are:

1. the reduction in time between the receipt of an answer and the provision of an interpretive response;
2. the provision of capacity to know what has not been answered as well as what has been answered; and
3. the provision of testing in direct relationship to the design of the learning exercise itself.

All of the above conditions have existed since programmed instruction started. However, there has not been a subsequent revision of test theory to accomodate these new conditions. The new conditions really have profound effect upon test theory and practice and these profound effects must find their way into our preparation of counselors for the future if we are to prepare persons to work with computerized guidance information systems.

The existence of an information generating system such as the ISVD places an additional burden on existing testing theory which also has implications for the manner in which counseling and personality theory should be taught. The information generating function is that of creating awareness not alone of the procedures for choosing, but also both of the choice process and of the self in the choice process. Consideration of this relationship among choosing procedures and choice and self processes requires re-examination of the relationship between the known and the measured as that relationship is now conceived in testing theory. In a

revised theory, the knower as thinker must be brought into central focus in the relationship between the known and the measured (see Tiedeman and Field, 1968). The known and the person reciprocally act upon each other. As the knower comes to understand that interaction, he comes to understand himself and to appreciate his avenues for independent action in the interdependent human condition. Instructing counselors so that these realizations emerge will require revision in our courses on tests and measurements as well as in our courses on counseling and personality theory and assessment.

Finally, an ISVD will be embedded in computer technology. An ISVD will itself be designed so that the counselor does not need to know the computational side of that technology. However, an ISVD will allow counselors as well as inquirers to create their own control systems for data processing, management, and retrieval. Therefore, our instruction of future counselors must incorporate at least that much preparation in computer technology into the education of the counselor. Actually more education of this kind could be beneficial although not necessary. The benefits will be those which accrue from understanding <u>why</u> something happens as well as from understanding <u>that</u> something happens. If counselors know the why of computer technology they will be in better position to improve an ISVD so that it functions more harmoniously with its theory than it undoubtedly will in its earliest field phases.

<u>Theoretical Changes Needed to Sustain Emerging Computerized Guidance Information Systems</u>

<u>A Theory of Career Implied by an ISVD</u>. My major effort yesterday and today has been to convince you that the theory of vocational development

has so far largely been devoid of a theory of career. This may seem like a harsh assertion particularly in relation to the work of Super who has emphasized the necessity for study of career patterns. My thought would not today be in the shape it takes without Super's prior work and conversations with me. However, I do want to emphasize that the two papers I prepared for this Symposium stress a new aspect of career, namely the personally-determined career.

The personally-determined career must be conceived as a career in being, not as a career in existence. This stance brings attention on the capacity of man to honor the tacit dimension in himself. The honoring of the tacit dimension has a long tradition in liberal education. The search for understanding of that dimension through universal studies has long been undertaken by persons such as Richards (1955). Richards who searches for meaning in liberal arts strives to write the more explicit operations involved in bringing the possibility for accumulated gain into the humanities and thus to write of a science of the humanities. Richards' conceptions brings him to desire a United Studies. My conceptions parallel those of Richards. However, where he has used dialogue and criticism as his major conceptions, I have used interaction and effective curiosity as mine. Thus, instead of seeking the United Studies as does Richards, I seek the United Self, a self in which vocational development is a part of a larger and personally-determined career, only some parts of which will be vocational in nature.

In seeking a science of the humanities, Richards found it necessary to turn his attention from the traditions of the humanities to their programs. The switch in attention is significant. A tradition is something

which is merely to be respected; a program something to be done. It was in conceiving the humanities as something to be done that Richards proved able to focus on criticism and use as major functions which ought to be associated with humanistic studies. This focus brought him to realize that it is the feedforward of an internally organized patterning of thought and action which is the goal of one who teaches the student in the humanities as well as of the scholar in the humanities who studies his subject. "The humanities, they are me," not "The humanities, I am them," became the principal organization for Richards' thought.

In seeking a science of career, I went through a parallel development. By putting facts/data of vocation into the context of individually guided use, I also discovered with Frank Field the necessity for the feedforward mechanism in career development. In fact, I am presently reasonably well convinced that this feedforward mechanism <u>is</u> the career. It is true that, the career's effectiveness depends on a simultaneously developing feedback mechanism. However, the two are not identical and feedback is non-existent in the absence of feedforward.

I have attempted to give explicit expression to my theory of career in this paper. However, the changes in vocational theory which this theory entails are not well understood at the moment. Hence I suffer no illusions that I shall achieve a revolution overnight. I will be satisfied if I can merely contribute to the evolution of theory in career development.

<u>A Revised Philosophy Implied by an ISVD</u>. We psychologists tend to pride ourselves on our sceptical natures. "Show me!" has been our shibboleth. This is an attitude understood in Missouri but potentially detrimental to psychology.

The "Show me!" game has a disadvantage which psychologists frequently permit themselves to be deceived by. If you ask someone who is himself in doubt to show you, you risk having him back off from his intuition. When this tendency is combined, as psychologists do combine it, with the demand that what is to be shown must also be explicitly delineated prior to its study, the tautology is completed. What psychologists study then becomes only what psychologists are interested in, not what individuals are living. Thus, we psychologists unconsciously permit ourselves to stray from the proper object of our regard, psychology, into the improper motive of ourselves, power over another.

I have myself faced this paradox and have tried to do something constructive about it in recent years. I have particularly focussed my regard on the problem of letting another form his goals, not on another's acquisition of my goals. This shift of attention permitted me to deal with the integration of thought and action which a person achieves as he engages in the from-to kind of knowing which Polanyi (1968) describes. There are three elements of from-to knowing according to Polanyi, namely: 1) the subsidiaries from which attention is focussed, and 2) the object on which attention is actually focussed. The person as the third part of tacit knowing integrates the subsidiaries and their foci. This integration is also the feedforward of which Richards speaks.

The change in attention from explicit behavior to tacitly based action brings a considerable change in attitude toward psychology. The important object of study is not behavior; it is the basis for behavior. The study of the bases for behavior means that reports by individuals must become the basic data from which explicit study originates. In

the career realm, these requirements additionally move the criterion of psychology from success (a goal in my terms) to satisfaction (an action formed, justified, and lived in my subject's terms).

The needed changes in psychology are again profound. Because they are profound, I expect that they will occur only gradually if they occur at all. I can only hope therefore, that my capacity to make them slightly more explicit and your capacity not to dismiss me as either facetious or confused will in some small way contribute to their becoming more understood, accepted, and practiced.

Will Computerized Guidance Information Systems Become an Operational Reality?

I first stated that computerized guidance information systems are today a reality among us. I then indicated that this fact of existence could become a present reality of expanded and higher level service in guidance if the economy of guidance, the educational organization for guidance, the theories of guidance, career, and psychology, and we were to change. A change in one without either of the others will not be enough to put us into the new era I envision.

It is not presently possible for me to assess well the likelihood that the three conditions simultaneously needed for bringing the computerized guidance information systems into an expanded and improved operational reality will exist simultaneously. In the economic realm, it is likely that a number of the subordinate functions in a computerized guidance information system are sufficiently profitable in our present economy for them to come into being as separate entities. In addition, many computer

technologists stand ready at any moment to consult with counselors and to construct individually tailored computerized guidance information systems. For these reasons I tend to think that the potential technological and economic barriers are probably less formidable than you counselors and we psychologists and counselor educators will ourselves prove to be.

In the human realm, the barriers to my hope may exist because of several reasons. First you counselors must familiarize yourselves with computerized guidance information systems and with the possibilities for improved guidance service which they offer to students and other inquirers. Then you must form and advance the resolve necessary to generate the increased financial support which is required to augment present guidance services by the improved level of goal seeking which computerized guidance information systems will make possible. However, before you are likely to do this, you must bring yourself from a fear which I have frequently found that counselors associate with the computer. The computer is <u>not</u>, as you probably fear, a monster which will determine the lives of inquirers and put counselors out of work. Instead it is as I said yesterday, a potential slave which can bring the best of facts/data and their scientific processing directly to inquirers, so that you counselors can have as immediate an educational context as a teacher now does, one in which the process of reasoning can be brought to issue with the students you counsel. However, <u>our</u> use of the reasoning process contrary to the teacher's use of that process will be particularly directed towards its import for self, not subject, understanding and appreciation. It will also be for the generation of knowledge about a sensible area in one's life space in which one can

make a difference if one but acts in that area as if one were an agent of one's destiny. Your belief in such a magnificent possibility requires that you first make the computerized guidance information system your slave so that you can in turn be the professional who helps other inquirers make the computer their slaves. In order to do this job you will have to re-educate yourselves somewhat as I have indicated in the previous section and so will your mentors. Your mentors will in fact have to revise a considerable portion of their programs which are now preparatory for counseling. But your mentors are not alone those who will have to change in the academic community. Psychologists will have to change as well. Psychologists will have to make room for career in vocational psychology and for individuality in psychology. These things can only be accomplished by simultaneous revision of the philosophy of science in which the study of psychology rests.

I outline a difficult task. However, I am an optimist and am persuaded that we counselors and psychologists need the challenge of a difficult task for a change. I think the computerized guidance information system offers us a big opportunity to bring an important innovation into the endeavor of education. We have not done well at innovating during the past decade. Let's do a much better job in the two decades now before us. If so, 1988 will truly see a new advance in our civilization.

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